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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/612,069	07/03/2003	Mark Alexander Groninger	0142-0416P	3514

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EXAMINER

NGUYEN, LAM S

ART UNIT PAPER NUMBER

2853

DATE MAILED: 04/25/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/612,069

Applicant(s)

GRONINGER ET AL.

Examiner

LAM S. NGUYEN

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 03 February 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1 and 3-8 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1 and 3-8 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07/03/2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |                                                                                                                        |                                                                                         |
|------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                            | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____                                                |

**DETAILED ACTION*****Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 12/13/2005 has been entered.

***Drawings***

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: References 9 and 15 in FIG. 1 are not mentioned in the specification. "PF" in FIG. 4B should be corrected as "PE".

Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Specification***

The disclosure is objected to because of the following informalities: The brief description of the drawings regarding to FIG. 4 and FIG. 5 (paragraphs [0026], [0027]) should be corrected to mention FIG. 4A-4B and FIG. 5A-5B, respectively. Appropriate correction is required.

#### ***Claim Objections***

- Claim 1 is objected to because of the following informalities: The word “than” cited in “the duct changes in such a manner than an ink drop ..” (line 5) should be corrected as “that”.

Appropriate correction is required.

- Claim 2 is objected to because of the following informalities: The applicant as indicated in the preliminary amendment dated 07/03/2003 has canceled claim 2. As a result, the claim status should be indicated as “Canceled” rather than “Original”. Appropriate correction is required.

#### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. Claims 1, 4-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang (US 5757392) in view of Yasutomi (JP410235860A).

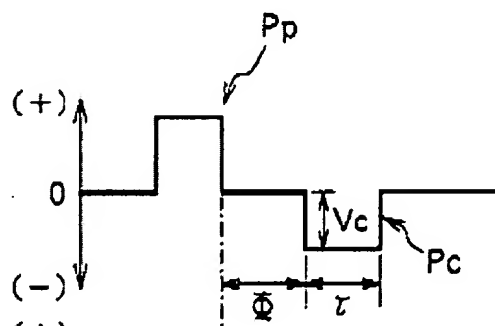
#### **Referring to claims 1, 7-8:**

Zhang discloses a method of controlling an inkjet printhead in an ink jet printer containing a substantially closed duct (*FIG. 8, element 10: The closed duct is expressed as “the*

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pressure chamber”) in which ink is situated, said duct having at least one exit opening for the ink (FIG. 8, element 22: The exit opening is expressed in term of “nozzle”), which comprises:

applying (by an actuation unit) an actuation pulse (FIG. 7: DRIVE VOLATGE) to an electro-mechanical transducer (FIG. 8, elements 16, 60) so that the pressure in the duct changes in such a manner than (that) an ink drop (FIG. 8, element 20) is ejected from the exit opening (FIG. 8, element 22) (The actuation pulse is a combination of a group of pulses including pulse  $P_p$  for causing ink ejection to form image (column 7, lines 39-46) and pulse  $P_c$  for negating (damping) pressure fluctuations in the pressure chamber (column 7, lines 49-52). Zhang’s drive voltage thus reads on the applicant’s actuation pulse defined as a group of pulses including a pulse for causing ink ejection (52) and pulses for damping (53-54) the pressure in the ink duct (FIG. 5B and specification, paragraph [0038], lines 10-18));



measuring (by a measuring unit) an electric signal generated by the electro-mechanical transducer real time during the application of the said pulse (column 7, lines 60-67: Residual pressure fluctuations in the pressure chamber (after application of the pulse voltage  $P_p$ ) causes the piezoelectric element to generate an electrical signal  $V_s$  that is detected and used to calculate the voltage pulse  $P_c$  required for negating residual pressure fluctuations in the

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*pressure chamber 10 (column 8, lines 11-15). The process is considered real time because the detection is done after the application of pulse Pp and before the application of pulse Pc. In other words, the detection is done during the application of the actuation pulse, as defined above, comprising both pulse Pp and pulse Pc), and*

*real time adapting (by a control unit) the same actuation pulse on the basis of the measured signal (column 8, lines 10-15: The calculation circuit 34, based on the detection signal Vs, calculates the voltage pulse Pc (of the same actuation pulse) for compensating the residual pressure fluctuations in the duct). (Please noticed that the process is considered real time because the adapted pulse Pc and the pulse Pp are of the same actuation pulse).*

Zhang, even though teaches measuring an electrical signal generated by the transducer and adapting the actuation pulse based on the measured electric signal, but does not teach measuring the electrical impedance of the transducer and adapting the actuation pulse based on the measured impedance..

Yasutomi discloses a process in an ink jet printer comprising an electromechanical transducer (*FIG. 3, element 313*) for causing ink ejection from a pressure chamber (*FIG. 3, element 305*) in accordance to the application of an actuation pulse, wherein the process includes steps of measuring electric impedance of the transducer and adapting the actuation pulse on the basis of the measured impedance (*Abstract and paragraph [0059]*) in order to maintain a high quality for the recorded images regardless of the fluctuations of the surrounding temperature (*paragraph [0005]*).

Therefore, it would have been obvious for one having ordinary skill in the art at the time invention was made to modify Zhang's process to also measure the electric impedance of the

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transducer and adapt the actuation pulse based on the measured impedance as disclosed by Yasutomi.

The motivation for doing so would have been to maintain a high quality for the recorded images regardless of the fluctuations of the surrounding temperature by detecting the physical properties of the transducer that are changed by surrounding temperature as taught by Yasutomi (*paragraph [0008]*).

- **Zhang also discloses the following claimed inventions:**

**Referring to claim 4:** which is used to attain the pressure required to eject the drop at a specific speed and at a predetermined time (*column 14, lines 22-27: Ejecting a liquid droplet with a set volume at a predetermined speed at a time which matches a suitable pressure level in the pressure fluctuation*).

**Referring to claim 5:** which is used to change the pressure after the ejection of the drop and wherein after the ejection of the drop, the pressure is brought substantially to a reference value (*After the ejection of a drop due to the application of pulse  $P_p$ , the application of the adapted pulse  $P_c$  certainly changes the pressure respect to a case where the pulse  $P_c$  is not adapted or applied*).

**Referring to claim 6:** wherein after the ejection of the drop, the pressure is brought substantially to a reference value (*column 9, lines 5-8: The pulse  $P_c$  is calculated so that the residual pressure fluctuation can be precisely reduced. Therefore, the pressure in pressure chamber 10 is stable. In other words, the application of pulse  $P_c$  brings the pressure to a reference value at that the pressure is stable*).

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2. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang (US 5757392) and Yasutomi (JP410235860A) as applied to claim 1, and further in view of Niikawa et al. (US 4866326).

Zhang, as modified, discloses the claimed invention as discussed above and also teaches wherein the actuation pulse applied to the electromechanical transducer is a voltage pulse (*Abstract*).

Zhang, as modified, however does not teach measuring a reacting current generated by the electromechanical transducer.

Niikawa et al. discloses an ink jet printer having a piezoelectric actuator (electromechanical transducer) for causing ink ejection when a voltage is applied to charge and deform the piezoelectric actuator (*column 1, lines 18-25*), wherein during the charge period (*FIG. 10, step S306: Transistor 131 is turned on to provide charge energy to the piezoelectric actuator 102*), a charge current (reacting current) is detected and fed back to a voltage controller (*column 13, lines 21-27 and FIG. 10, step S308: The current is detected and fed back to controller 130*) in order to determine the voltage across the piezoelectric element (*column 13, lines 25-30*).

Therefore, it would have been obvious for one having ordinary skill in the art at the time invention was made to modify Zhang's ink jet printer, as modified, to include the step (or an element) for measuring the charge current (reacting current) as disclosed by Niikawa et al.

The motivation for doing so would have been to suitably control the voltage across the piezoelectric element based on the relationship between the detected current and a reference or

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target value in order to obtain consistent operated position of the piezoelectric element irrespective of its temperature as taught by Niikawa et al. (*column 13, lines 30-43*).

***Response to Arguments***

Applicant's arguments with respect to claims 1 and 7 have been considered but are moot in view of the new ground(s) of rejection.

***CONTACT INFORMATION***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LAM S. NGUYEN whose telephone number is (571)272-2151. The examiner can normally be reached on 7:00AM - 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, STEPHEN D. MEIER can be reached on (571)272-2149. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



04/17/2006